

IN THE SPECIFICATION:

On page 1, line 3, please replace the heading “Technical Field” with TECHNICAL FIELD.

On page 3, please amend the paragraph beginning on line 8 as follows:

However, the above-mentioned embedding-expanding method has the following problems. One of the problems is that the embedded and expanded steel pipe has remarkably lowered collapse resistance to the external pressure in the ground. This means [[lowing]] lowering of its collapse strength. Another problem is that the expanded pipe generates bending.

On page 5, please amend the paragraph (b) beginning on line 4 as follows:

b) If the steel pipe has a non-uniform wall thickness ratio E0 before expanding and satisfies the following expression ①, the lowering of the collapse strength of the expanded pipe is not serious.

$$E0 \leq 30/(1 + 0.018\alpha) \quad \dots \textcircled{1}$$

Wherein α is a pipe expansion ratio [[(%))] calculated by the following expression ②.

$$\alpha = \{ (\text{inner diameter of the pipe after expanding} - \text{inner diameter of the pipe before expanding}) / \text{inner diameter of the pipe before expanding} \} \times 100 \quad \dots \textcircled{2}$$

E0 is a non-uniform thickness ratio [[(%))] of the pipe before expanding calculated by the following expression ③.

$$E0 = \{ (\text{maximum wall thickness of the pipe before expanding} - \text{minimum wall thickness of the pipe before expanding}) / \text{average wall thickness of the pipe before expanding} \} \times 100 \quad \dots \textcircled{3}$$

The non-uniform wall thickness ratio E1 [[(%))] of the pipe after expanding is calculated by the following expression ④.

$$E1 = \left\{ \left(\frac{\text{maximum wall thickness of the pipe after expanding} - \text{minimum wall thickness of the pipe after expanding}}{\text{average wall thickness of the pipe after expanding}} \right) \right\} \times 100 \quad \dots \textcircled{4}$$

On page 6, please amend the paragraph beginning with line 10 as follows:

(1) A steel pipe, which could be expanded radially after being embedded in a well, characterized in that the non-uniform wall thickness ratio $E0$ [(%)]] before expanding satisfies the following expression ①.

$$E0 \leq 30 / (1 + 0.018\alpha) \quad \dots \textcircled{1}$$

Wherein α is the pipe expansion ratio [(%)]] calculated by the expression ②.

On page 7, please amend the paragraph beginning with line 5 as follows:

(3) A method of embedding oil well steel pipes, having smaller diameters one after another, characterized by using the steel pipes according to any one of said (1) or (2) and by comprising the steps of the following (a) to (h);

(a) Embedding a steel pipe in an excavated well,

(b) Further excavating the underground on the front end of the embedded steel pipe to deepen the well,

(c) Inserting a second steel pipe, whose outer diameter is smaller than the inner diameter of the embedded steel pipe, into the embedded steel pipe, and embedding the second steel pipe in the deepened portion in the well,

(d) Expanding the second steel pipe radially by a tool inserted therein to increase the diameter,

(e) Further excavating the underground on the front end of the second expanded steel pipe to deepen the well,

(f) Inserting ~~another~~ a third steel pipe, whose outer diameter is smaller than the second inner diameter of the expanded steel pipe, into the expanded second steel pipe, and embedding the third steel pipe in the deepened portion of the well,

(g) Expanding the third steel pipe radially, and

(h) Repeating said steps (e), (f) and (g).

On page 8, please amend the paragraph beginning with line 1 as follows:

Fig. 7 is a view explaining the non-uniform wall thickness ratios. Particularly, FIG.7 (a) is a side view of the oil well pipe, and FIG.7 (b) is the cross-sectional view. As shown in (a) and (b) of FIG.7, a cross section at a position in the longitudinal direction is equally divided into 16 parts at the intervals of 22.5°, and wall thickness of the pipe in each of the parts is measured by an ultrasonic method or the like. From the measured results, the maximum pipe wall thickness, the minimum pipe wall thickness and the average pipe wall thickness in its cross section are respectively obtained, and the non-uniform wall thickness ratios $[(\%)]$ are calculated by the following expression ⑤.

Non-uniform wall thickness ratio $[(\%)] = \{ (\text{maximum pipe wall thickness} - \text{minimum pipe wall thickness}) / \text{average pipe wall thickness} \} \times 100 \quad \dots \textcircled{5}$

On page 9, please amend the paragraph beginning with line 13 as follows:

FIG. 5 shows relationships between the non-uniform wall thickness ratios of before and after expanding. As can be seen from FIG. 5, the non-uniform wall thickness ratio of the pipe after expanding is larger than that of the pipe before expanding. Further, as can be seen from FIG.5, the non-uniform wall thickness ratio of the pipe after expanding is substantially proportional to the non-uniform wall thickness ratio of the pipe before expanding and the coefficient of proportionality is differentiated by the pipe expansion ratio. The relationships (solid lines in FIG.5) between E1 and E0 of each pipe expansion ratio are expressed by one expression, i.e., the following expression ⑥.

$$E1 = (1 + 0.018\alpha) E0 \quad \dots \textcircled{6}$$

Wherein E0 is the non-uniform wall thickness ratio $[(\%)]$ of the pipe before being expanded and E1 is the non-uniform wall thickness ratio $[(\%)]$ of the pipe after being expanded. Accordingly, the non-uniform wall thickness ratio of the expanded pipe can be estimated by the expression ⑥ before expanding of the pipe.

On page 10, please amend the paragraph beginning with line 4 as follows:

FIG.6 shows the relationships between “actually measured collapse strength/calculated collapse strength of the expanded pipe without non-uniform wall thickness” and the non-uniform wall thickness ratio of the pipe after being expanded. The relationship was found in the above-mentioned test. The calculated collapse strength (C0) of the expanded pipe without non-uniform wall thickness is a value calculated by the following expression ⑦.

$$C0 = 2 \sigma_y \left\{ \left[\frac{(D/t) - 1}{(D/t)^2} \right] \left[1 + \left\{ 1.47 / (D/t) - 1 \right\} \right] \right\} \quad \bullet \bullet \bullet \textcircled{7}$$

σ_y in the expression ⑦ is yield strength (MPa) in the circumferential direction of the pipe, D is an outer diameter (mm) of the expanded pipe and “t” is a wall thickness (mm) of the expanded pipe. The expression ⑦ is described in “Sosei-To-Kakou” (Journal of the Japan Society for Technology of Plasticity) vol. 30, No. 338 (1989), pages 385-390.

On page 10, please amend the paragraph beginning with line 17 as follows:

As apparent from FIG.6, in the cases of 10 [%] and 20 [%] of the pipe expansion ratios, when a non-uniform wall thickness ratio of the expanded pipe reaches 30 [%] or more, the collapse strength is remarkably lowered, resulting in decrease of 20 [%] or more in comparison with the collapse strength of the pipe without a non-uniform wall thickness. Alternatively, in the case of 30 [%] of the expansion ratio, when a non-uniform wall thickness ratio of the expanded pipe reaches 25 [%] or more, the collapse strength is remarkably lowered, resulting in a decrease of 20 [%] or more in comparison with the collapse strength of the pipe without non-uniform wall thickness.

On page 11, please amend the paragraph beginning with line 1 as follows:

As described above, the reason for the lowering of collapse strength is the fact that the roundness of the pipe remarkably deteriorates and a synergistic effect of both the non-uniform wall thickness and the deterioration of the roundness lowers the collapse strength, when the non-uniform wall thickness ratio of the expanded pipe exceeds 25 [%] or 30 [%]. Further, in a high pipe expansion ratio of 30 [%] or more, when the non-uniform wall thickness ratio of expanded pipe exceeds 10 [%] or more, the lowering of collapse strength is remarkably increased. In order

to maintain .80 or more of the “actually measured collapse strength/collapse strength of the pipe without non-uniform wall thickness”, the non-uniform wall thickness ratio of the expanded pipe should be set to 30 [[%]] or less.

On page 11, please amend the paragraph beginning with line 12 as follows:

As mentioned above, the non-uniform wall thickness ratio E1 of the expanded pipe can be estimated by expression ⑥. Therefore, conditions to make E1 30 [[%]] or less are to satisfy the following expression ⑧.

$$E1 = (1 + 0.018 \alpha) E0 \leq 30 \quad \dots \textcircled{8}$$

From the above expression ⑧ the following expression ① is obtained.

$$E0 \leq 30 / (1 + 0.018 \alpha) \quad \dots \textcircled{1}$$

On page 14, please amend the paragraph beginning with line 2 as follows:

The eccentric non-uniform wall thickness (the first order of the non-uniform wall thickness) of the steel pipe is generated in the production process of steel pipe when, for example, a plug, which is a piercing tool of a piercer, is applied to a position shifted from the center of the cylindrical billet during piercing. As mentioned above, the eccentric non-uniform wall thickness is a non-uniform wall thickness in which a thin wall thickness portion and a thick wall thickness portion exist at a cycle of 360 degrees respectively. Accordingly, the eccentric non-uniform wall thickness ratio [[(%)]] can be defined by the following expression ⑩.

On page 14, please amend the paragraph beginning with line 14 as follows:

As shown in FIG.9, the larger the eccentric non-uniform wall thickness ratio is, the larger “1/radius of curvature” becomes, that is, the bending becomes larger. When the steel pipe is used for an oil well pipe, the “1/radius of curvature” must be 0.00015 or less to ensure the reliability of threaded portions, and 0.0001 or less is preferable. 0.00005 or less is more preferable. As can be seen from FIG.9, the steel pipe may be used for an oil well pipe if its eccentric non-uniform wall

thickness ratio of non-expanded steel pipe is 10 [%] or less, preferably 8 [%] or less, and more preferably 5 [%] or less, even if the steel pipe is expanded with the expansion ratio of 30 [%].

Please amend table 2 on page 25 as follows:

Delete the “%” signs from the column headings “Expanding Ratio (α) %”, “Non-uniform Wall Thickness Ratio after Expanding (E0) %”, and “Non-uniform Wall Thickness Ratio after Expanding (E1) %”.

Please amend table 3 on page 27 as follows:

Delete the “(%)” from each of the three column subheadings entitled “Non-uniform Wall Thickness Ratio (%)”.

A clean copy of each table is submitted herewith at the end of this Amendment.

On page 28, the fourth to last line, please replace the heading “INDUTRIAL APPLICABILITY” with “INDUSTRIAL APPLICABILITY.”